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THE EFFECT OF DIGITALIS IN TWO CASES OF ARRHYTHMIA IN DIPHTHERIA

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In a recent paper one of us (Schwensen[1]) has shown that a complex disturbance of the rhythm of the heart often is present in the cases that are fatal in the acute stage of diphtheria. The possibility of this abnormal rhythm being the result of attacks of auricular flutter was discussed. If this determination of the type of the irregularity is correct there should be a chance of checking this disturbance by treating the patients with full doses of digitalis. We have had the opportunity of trying this treatment in the following two cases:

Case 1.—A 6 year old girl admitted on the 4th day of illness on Oct. 11, 1920, and discharged Jan. 13, 1921, was suffering from grave diphtheria, membrane covering the tonsils, the uvula and the soft palate. In all 184,000 units of diphtheria antitoxin (8,000 units intravenously) were administered in the first 3 days in hospital.

Examination of the heart on Oct. 12 was negative with the exception of a faint systolic blowing which was heard over the whole precordial area. The liver did not extend below the costal margin in the nipple line.

The urine was examined every 3rd day and showed traces of albumin between Oct. 15 and Nov. 5.

On Oct. 19 she became pale and slightly cyanotic. Examination of the heart revealed considerable dilatation on the right side, the right border extending to the right parasternal line. The sounds were indistinct and muffled. The liver extended 3 cm. below the costal margin in the nipple line.

She was very restless. The extremities and face were cold. She talked with pronounced snuffle. The veins of the neck were much distended and pulsated much. The liver now reached the umbilical line, and was very tender on palpation. The heart beat was now felt 2 cm. to the left of the left nipple line in the 5th intercostal space. The right border extended beyond the right parasternal line. The first sound was faint and muffled at the apex, the second pulmonary sound was strongly accentuated. The rhythm was quite irregular. She was very pale and cyanotic.

On Oct. 21 the liver reached 2 cm. below the umbilical line; the veins of the neck still pulsated strongly. Examination of the heart gave the same results as on the preceding day. Tracings obtained are shown in charts 1 and 2. The blood pressure was 70. Digisolvin[2] was given three times (at 1 p. m., 6 p. m., and 11 p. m.), in doses of 1 c c.

Received for publication, August 29, 1921.

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[1] Jour. Infect. Dis., 1922, 30, p. 279.

[2] Digisolvin is a physiologically standardized Danish preparation of digitalis; 1 c c corresponds to 15 centigram of fol. titrat.

On Oct. 22 she had improved slightly. The heart beat was now only 1 cm. beyond the nipple line, and the right border extended only 1 cm. beyond the right sternal margin. The liver did not quite reach the umbilical line. The rhythm of the heart was occasionally irregular; the tracings were still like those in fig. 2. At 5 p. m. the character of the tracings was still unaltered. The veins were much distended and pulsated strongly.

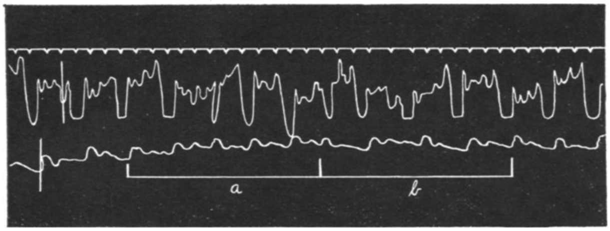

Chart 1, Case 1.—The radial pulse is irregular but with spacing. (These tracings were made with a Jacquet's polygraph. The time marking always corresponds to 1/5". The upper curve is always the jugular, the lower the radial.)

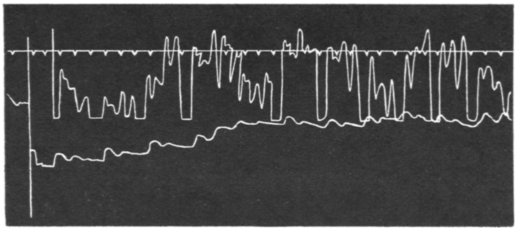

Chart 2, Case 1.—Very big waves in the jugular tracing.

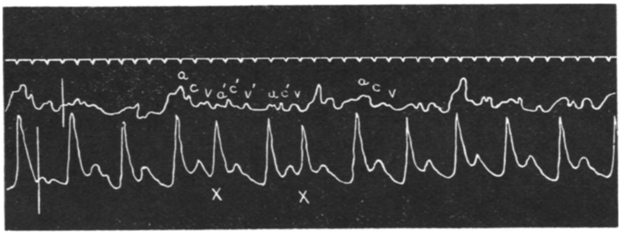

Chart 3, Case 1.—The jugular curve is now normal, the big waves have entirely disappeared. Two extrasystoles of auricular origin are seen in this chart.

On Oct. 23, the liver extended only 3 cm. beyond the costal margin. The veins of the neck were not distended and pulsated slightly. The color of her face was normal. The child was lively. Examination of the heart showed the same features as on the preceding day, only the rhythm was regular but for an occasional extrasystole (fig. 3). The blood pressure was 100.

In the following days the liver diminished and after Oct. 30 it did not reach below the costal margin. Extrasystoles were present until Nov. 17. When discharged she had a muscular mitral inefficiency (the right border did not pass beyond the border of the sternum, and the heart beat was felt inside the nipple line. Over the whole precordial area a harsh systolic murmur was heard).

Case 2.—A 10 year old girl admitted on the 3rd day of illness, Dec. 13, 1920, died Dec. 20, 1920. She was suffering from grave diphtheria, the membrane covering the tonsils, the uvula and the soft palate, reaching the gums. In the first 3 days of the stay in hospital 340,000 units of diphtheria antitoxin were administered. The membranes diminished slowly but had not entirely disappeared on the day of death. Examinations of the heart showed that it was normal except for faint and muffled sounds until the evening of Dec. 16, when there was a great disturbance of the rhythm (fig. 4 and 5). One c c of digisolvin was then given 4 times (at 6 p. m., 10 p. m., 2 a. m., and 6 a. m.). On the following morning (Dec. 17) the tracings were normal but for an occasional ventricular extrasystole (fig. 6). The heart was normal but for muffled and faint sounds. The liver extended only 1 cm. below the costal margin. The next day (Dec. 18) the tracings showed respiratory arrhythmia. The urine contained a trace of albumin.

The following morning the liver did not extend below the costal margin. Examination of the heart showed that the heart beat was inside the nipple line. Furthermore, there was again a disturbance of the rhythm and tracings showed partial heart block. The rate was only 56. The veins of the neck were only slightly distended. At 4 p. m. the liver extended 2 cm. below the costal margin. The veins of the neck were considerably distended and pulsating. Tracings still showed partial heart block with a ventricular rate of about 50. Sometimes there were long intervals between the beats of the ventricle (the longest measured 2″). The rhythm was very irregular. The heart beat was now felt 1 cm. beyond the nipple line. The right border did not extend outside the right sternal border. As the case, according to our experience, was desperate, we administered digisolvin (1 c c) at 5 p. m. and 1 a. m. with the intention of either producing a complete heart block or of making the degree of heart block more stationary and in this way improving the circulation. At 8 p. m. she looked very ill; she was pale, cyanotic and cold. The veins of the neck were very much distended and pulsating visibly. There had not been any syncopal attacks. The liver now extended to the umbilical line. In examining the heart a pronounced dilatation was found, the right border extending to the right parasternal line; the heart beat was felt 3 cm. outside the left nipple line. The sounds were muffled, nearly inaudible. The rhythm was very irregular (fig. 7), the longest pause being more than 3″. At 11 p. m.: During the last two hours she had suffered much from pains in the right side of the abdomen. She was cold as ice and very pale with a pronounced cyanosis. The veins of the neck were unchanged. The liver extended 2 cm. below the umbilical line. The heart was in the same condition as at 8 o'clock. The rhythm was very irregular but of the same type as in fig. 7. She died at 4 in the morning.

In the 10 cases of a complex arrhythmia occurring during the first 2 weeks of the illness, which one of us [1] described, all the patients died in the course of a few hours or a few days after this irregularity had set in; the irregularity remained always of the same type until death.

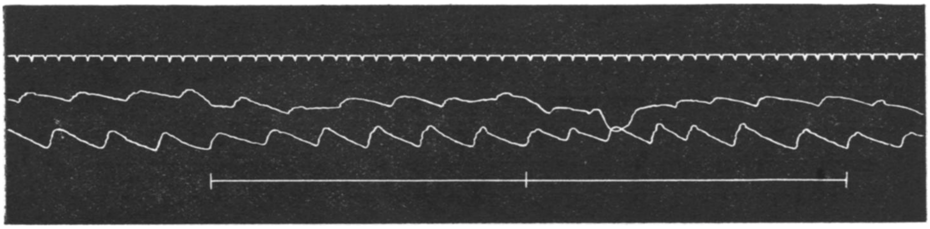

Chart 4, Case 2.—The radial curve shows irregularity with spacing.

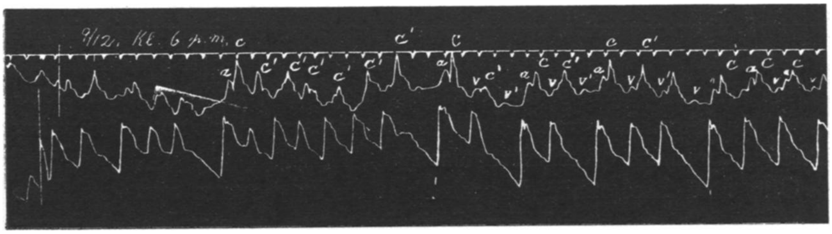

Chart 5, Case 2.—The radial curve shows attacks of regular tachycardia with a rate of about 118 per minute. This shows that the irregularity cannot be that of respiratory arrhythmia.

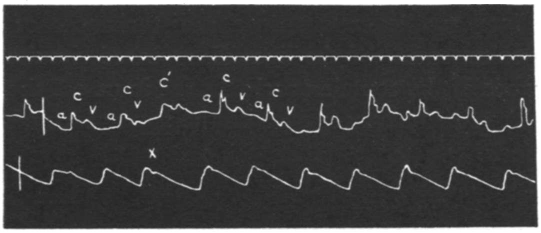

Chart 6, Case 2.—The curves are normal and the rhythm regular but for the occurrence of a ventricular extrasystole.

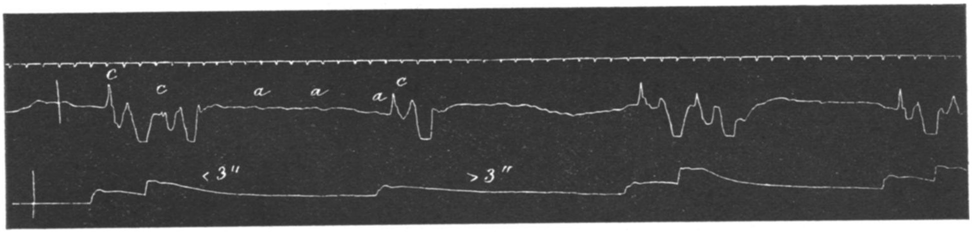

Chart 7, Case 2.—This tracing shows that the ventricle at times does not correspond to the auricle for long intervals, the longest interval being a little more than 3''.

In our two cases this irregularity set in at the usual time and was exactly of the same type as those of Schwensen.

After we had administered digitalis the arrhythmia stopped, and the tracings became normal with the exception of some extrasystoles. In the one case the child afterward recovered, in the second, death intervened a few days after as a result of the progressive acute myocarditis which attacked the atrioventricular bundle and produced partial heartblock.

The patient in our case 1 is the only one in our experience who has recovered after an attack of the complex irregularity in the acute stage of the diphtheria, and our observations are quite in accordance with those of other clinicians, who all agree that a severe irregularity in the acute stage of diphtheria in children means death in a few days.

The disappearance of this complex irregularity as a result of treatment with digitalis points to the correctness of the supposition that flutter is the cause of this irregularity.

Our two cases make it probable that in the treatment of these otherwise fatal cases with digitalis in full doses we may have a chance of curing the patient by saving the damaged myocardium from the great exertion caused by the irregularity.

Furthermore, these cases show how the greater degrees of enlargement of the liver are dependent on the disturbances of the rhythm. In case 1 the enlargement of the liver disappeared simultaneously with the disappearance of the complex arrhythmia; in case 2 the liver became very much enlarged simultaneously with the appearance of the irregular partial heartblock.